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MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCE

January 29, 1993

Revised 19 April 1993

Ms. Pat Potts
Dept. of Health and Environmental Services
Solid and Hazardous Waste Bureau
836 Front Street
Helena, MT 59620

Subject: Proposed Work Plan for Site Characterization
Mr. M Landfill Site
Lewistown, Montana

Dear Ms. Potts:

In accordance with our recent conversations we have prepared a work plan for characterization of the above referenced site. The plan has been prepared in general accordance with ARM 16-765, Subchapter 7. Revisions based on your comments of 12 April 1993 are incorporated in the plan.

We have gathered all readily available data with respect to the site and interviewed the owner/operator of the facility, Mr. Marvin Mintyala. Please note that published geotechnical information for the Lewistown area is limited and that we have utilized our own files to the extent possible. The work plan is structured with the reader/user in mind and does not follow the outline presented in Subchapter 7 *per se*.

If you have any questions or need further data please contact us.

Very truly yours,
ABENAKI GEOENVIRONMENTAL, INC.

Robert W. Gillespie, P.E.
Principal Geotechnical Engineer

RWG:mah
In Triplicate
cc: Marvin Mintyala (1)

**PROPOSED WORK PLAN
FOR
SITE CHARACTERIZATION
OF
MR. M LANDFILL
LEWISTOWN, MONTANA**

**TO
MONTANA DEPT. OF HEALTH AND ENVIRONMENTAL SERVICES
SOLID AND HAZARDOUS WASTE BUREAU
HELENA, MONTANA**

**PREPARED
BY
ABENAKI GEOENVIRONMENTAL, INC.
LEWISTOWN, MONTANA**

**JANUARY 1993
REVISED APRIL 1993**

INTRODUCTION

The purpose of the accompanying work plan is to provide the rationale for characterizing the Mr. M Landfill site in Lewistown, Montana. The work plan has been designed to utilize those data which are both available and valid, and to incorporate and correlate them with new data which are generated by the work proposed herein. The regulations promulgated in Subchapter 7 have been followed in the general case but deviations were necessary to accommodate the available data. Protocols for sampling, preservation, and transportation will be those recommended by NWWA and EPA.

The regulations contained in Subchapter 7 require that the site be characterized with respect to disposal, surficial geology, geohydrology, and hazards. Potential problems relating to the operation of the landfill and its environs must be identified and mitigation techniques developed as appropriate. Any situations involving hazardous wastes and/or substances must be identified and corrected.

The work plan is presented in sections which logically follow one another. Data are tabulated wherever possible for ease of reference and understanding, logic for deviations or alterations to the regulations are explained in detail.

BACKGROUND

The landfill is located on the north side of Hwy. 200 approximately 3 miles east of Lewistown, Montana; a locus map is provided on Figure 1. More specifically, it is an approximately 49 acre parcel located in the SW1/4 of Section 8, Township 15N, Range 19E. The 49 acres are composed of the 30 acre licensed landfill site and an adjacent 19 acre parcel; the latter is not included in the study. The site has been operated as a landfill since the mid 1970's and was purchased by Marvin and Sandra Mintyala in the early 1980's. The waste stream appears to be exclusively residential and light commercial with occasional acceptance of junk cars. Observed wastes were high in paper and plastic content with metals limited to food cans and the like. Few aluminum cans were observed at any location with the exposed working area. White goods and ferrous metals are accepted and stockpiled for transfer to scrap dealers and other appropriate disposal facilities.

Records review show that no monitoring or other environmental observations have been conducted on a regular basis at the facility. Several spot checks by DHES personnel are on file but contain only limited information.

The site characterization which is required by regulation has been requested by DHES in order to bring the Mr. M Landfill in compliance with existing statutes. The characterization assumes that the facility will remain a disposal for household and domestic type wastes. Special and/or hazardous wastes are specifically excluded from this site unless the proper investigations, designs, permits, and construction techniques are implemented.

SITE CHARACTERISTICS

Surface

The landfill is situated in a small south facing depression or half bowl. It is operated as both a trench and open disposal facility depending on the area being used. At the time of our visit in late November 1992 waste was being placed in the northwest section of the site. Placement was commensurate with the type of operation in that the waste is dumped, spread and compacted with a dozer, and covered with local borrow which is also spread and compacted with a dozer. Lift thicknesses are generally less than two feet. Trenches are typically v-shaped with 1H:1V sides slopes and depths of 15 feet or less. Bottom width is typically 10± feet.

Topographically the site is located on a south facing slope which rises to the north and northeast toward the foothills of the Judith Mountains. The overall drainage area is in excess of 4 square miles and appears to be drained by Boyd Creek which travels southwest out of the mountains past the southern edge of the site and into the prairie surrounding Lewistown. Numerous subdrainages are included within the basin as illustrated on Figure 2 attached. The landfill straddles a small ridge or promontory as illustrated on Figure 2. Most of the fill is placed along the crest, and the south and southeastern flanks of the ridge. We also noted a small (less than 2 acres) landfill area which has undergone closure on the south side of the active area. According to Mr. Mintyala the area contains domestic type waste from the Lewistown area.

A large earth cut is located along the northern property line and is accessed by a haul road which travels west and north. Daily cover is extracted from this location and transported to the active work area. The face is, in reality, a high wall in the bedrock underlying the site. More detail is provided in subsequent sections.

Surface water runoff is directed to two roughly parallel drainages which border the landfill. The flow exits through two culverts in the old railroad bed and flows along Hwy. 200 until it enters Boyd Creek about 1500 feet west of the site. Surface runoff from the

landfill proper is collected in shallow ditches along the toe and routed to a detention pond just north of the office building near the center of the site. Field observations show the system is reasonably effective although it was not engineered according to Mr. Mintyala. If flows are large, a small spillway routes flow from the first pond into a second. A spillway in the second pond acts as an outlet to the western most natural drainage. Silt from both ponds is removed on a regular basis and returned to the landfill area for use as cover. We will seek a determination of MPDES need from the Stormwater Management Program, Water Quality Bureau.

Several minor seeps were noted at the southern toe of the landfill but flow was insufficient to develop a quantitative estimate. Coloration was light brown to brown orange indicating relatively high iron contents and oxidation of the same. Their source is probably precipitation, and condensation from within the landfill mass. At this time we perceive nothing abnormal or pernicious with the situation. However, their influence on surface and/or ground water will be evaluated in the course of the study.

Subsurface and Ground Water

As presented earlier, little published information is available for the general Lewistown area. A cursory site investigation was made by Botz (1979) which developed limited but useful data with respect to surficial geology; the report is attached as Appendix A. Water well logs were obtained from Montana Bureau of Mines and Geology which provided data on bedrock geology and ground water levels. Reconnaissance mapping was accomplished during our November 1992 site visit. Copies of the well logs are attached as Appendix B. The quality is poor because the copies we have are also poor quality.

Surficial soils are probably residual in origin, being derived from the underlying siltstones and sandstones. Thickness is highly variable and least on ridge tops because of aeolian action and erosion by runoff. By the Unified Soil Classification System, the soils are usually SM, ML, and occasionally SC. They are high in calcium, iron, and carbonates, and can deposit carbonate salts under the right conditions. Excellent exposures are provided by the borrow operations for daily cover.

Bedrock is the Cretaceous age Kootenai Formation. The high wall exposure shows about 30 to 35 feet of silty, fine grained, poorly cemented or indurated sandstone underlain by a soft to friable, moderately plastic shale or claystone. Thickness of the shale is thought to be in the range of 20 to 50 feet based on exposures and water well logs. At the time of our site visit, the shale was exposed in the road leading to the borrow

at the base of the high wall. Water well logs show that the shale layer is apparently continuous over a significant part of the area east of Lewistown. Lithology as developed from the logs consists of sandstones underlain by the aforementioned shale layer followed by alternating layers of sandstone and shale. Water is derived from a "white" or "gray" sandstone unit at depths of 200 to 350 feet. Coloration is based on descriptions contained in the well logs. Water is under excess pressure and rises to levels which are 25 to 100 feet below ground surface. That is, the potentiometric surface is well above the source bed. Approximate locations based on well log descriptions and/or field reconnaissance are plotted on Figure 3. Elevations of ground water are also shown. The data show that the aquifer is the sandstone unit and that it is confined. The data also show that the gradient is to the southwest with a slope on the order of 0.02 to 0.05. The gradient should be considered as regional for the time being because of the sparseness of data. Localized gradients are possible because of the steep topography. The recharge area is probably in the foothills of the Judith Mountains or the Judith Mountains themselves. Well yields are typically less than 10 gallons per minute and water quality has been classified as fair to good. We could not locate any reports of contamination .

The data strongly suggest that the aquifer is protected by the shale layer at depths of 25 to 50 feet. While we would not use the term aquiclude it certainly classifies as an aquitard. Near surface ground water appears to be ephemeral and related to seasons and/or prolonged precipitation events. Botz observed water in one test pit and set a monitoring well to provide an observational point. According to Mr. Mintyala the well has been dry since its installation. Our field observations lead us to believe that near surface ground water is extremely limited, since the deep aquifer of Kootenai Formation appears to be protected and is apparently not influenced by the landfill. Therefore, emphasis will be placed on the shallow aquifer above the clayey shale stratum.

WORK PLAN

The following work plan has been developed to provide the data requested in 16.14.703 of the ARM. Succinctly, the purpose of the work is characterize the site from a geotechnical standpoint and use those data to design a short and long term monitoring plan for the protection of the environment. Line item descriptions and "bullets" have been use to allow the reader to grasp and digest the essence of the text without having to wallow in excess verbage.

Safety

Our field visit suggests that hazardous materials will not be an issue during the performance of the field portion of the work plan. However, Level C equipment will be on hand for all personnel during the field phase, and the site will be abandoned in the event a hazardous or potentially hazardous situation is encountered. If work continues beyond that point a formal health and safety program will be developed for use on site.

Surface

Surficial work is divided into site plan development and geotechnical work. The proposed scope is as follows:

1. review available low and high altitude aerial photography for the purpose of fault trace and lineament analysis. While none are expected to be found, we believe it to be the prudent course of action.
2. develop a site plan using the aerial photography and USGS quadrangle maps as bases. The plan will be at a scale of approximately 1"=200'.
3. conduct reconnaissance surficial and bedrock mapping of the site proper and the surrounding area for a distance of at least 1,500 feet. The data will be displayed on the aforementioned base plan. Emphasis will be placed on structure, stratigraphy, morphology, and potential aquifer recharge zones. The low level photographs will be used for correlative purposes.
4. evaluate all acquired field and office data to determine relationships between topography, structure, and morphology as they relate to the geohydrologic regime. Emphasis will be placed on the influences exerted by the landfill and its continued operation. Locations for subsurface explorations will be selected during this task.
5. prepare an interim report for use by the Bureau and Mr. Mintyala presenting our findings, and confirming or altering the balance of the work plan.

Subsurface

The subsurface section of the work plan is predicated on the data we have acquired to date. We reserve the right to alter the scope as dictated by field conditions but will notify the Bureau immediately of any changes. The regulations require approximately 30 subsurface explorations for this site. However, the well data already gathered are within the same section and should be considered valid for the purposes of this study. Therefore, 25 locations within the landfill site proper are proposed for exploration. Work plan items as follows:

6. excavate, log, and sample 18 test pits at locations generally conforming to the anticipated perimeter of the landfill. Locations are not shown on Figure 2 because of scale problems. The pits will be logged and sampled by our geotechnical engineer in general accordance with ASTM and USCS recommendations. Representative soil samples will be preserved in clean 1 liter glass jars for transport to our geotechnical laboratory. The pits will be logged continuously for lithology, structure, and evidence of ground water. In the event ground water is encountered in a test pit, the pit will be allowed to remain open in order to allow the ground water to stabilize. The level will be measured and referenced to a permanent benchmark, and a grab sample will be taken using a sterile bailer. Filtering and preservation will be in accordance with NWWA and EPA protocol.
7. drill, log and sample 7 monitoring wells at the locations shown on Figure 2. The borings would be drilled using rotary techniques with either an air or water matrix. Cuttings would be collected at frequent intervals at the discharge orifice and examined by our geotechnical engineer for soil or rock type and evidence of ground water. Standard penetration resistance (split spoon) samples will be taken at 55-foot intervals or more frequently at the engineer's discretion. If possible, undisturbed Shelby Tube samples will be obtained for laboratory permeability testing. All samples will be scanned for volatile organic compounds using an Hnu HW-101 photoionization detector. Any sample which exhibits a positive reading of greater than 2 ppm will be preserved in a sterile 40 ml VOA vial and refrigerated for transport to an analytical laboratory. The rig and its tools will be

cleaned prior to entering the site using steam cleaning and appropriate soaps and rinses. Similar cleanings will be accomplished in the event that contamination is encountered during the drilling process and between each boring. In addition to Hnu screening, the bore will be checked for methane using an O₂/LEL meter on a frequent basis.

8. establish monitoring wells in each bore to allow for ground water sampling and level measurements. Table 1 below provides a summary of the anticipated depths and screen lengths.

TABLE I

MONITORING WELL SUMMARY

Well No.	Depth	Screen Interval
1	top of shale	top of shale to 10 ft. above
2	top of shale	top of shale to 10 ft. above
2a	10' below bottom of shale	bottom of shale to 10 ft. below
3	top of shale	top of shale to 10 ft. above
3a	10' below bottom of shale	bottom of shale to 10 ft. below
4	top of shale	top of shale to 10 ft. above
4a	10' below bottom of shale	bottom of shale to 10 ft. below
5	top of shale	top of shale to 10 ft. above

Boring Nos. 6 and 7 will be used as exploratory holes to evaluate subsurface conditions prior to drilling the monitoring well bores while MW-1 and 2 are expected to be the background wells. Their location will be determined during the reconnaissance phase of the work. Well Nos. 2, 3, and 4 will be cluster wells with the "a" well being the deeper of the two. A 5 foot horizontal offset will be used for each cluster not that the well depths are designed to interpret interaction between soils and rock on which the landfill sits and those just below the shale

which appears to be an aquitard. We have not proposed any wells which penetrate the deep, sandstone aquifer which supplies water to the surrounding area. In fact, at least 100 feet of non-water bearing siltstone, sandstone, and shale beds separate the wells from the deep aquifer.

The wells will be constructed in accordance with DHES and NWWA requirements. Elevations of ground surface, top of casing, and top of well will be determined by level survey tied to NGVD datum. Well development will be by bailer since anticipated flow quantities are quite small.

9. purge and sample all wells in accordance with EPA and NWWA protocols to obtain a baseline sample suite from which to design the future sampling and analysis program. Sterile disposable bailers will be used which obviates the need for a rinsate blank sample. Preservation and filtration will be in accordance with the same protocols unless field conditions dictate that other protocols are more appropriate. We also propose to sample the water supply well at the nearby Mintyala residence and test it for the same parameters as the other samples.
10. sample any seeps from the landfill using grab or composite methods.
11. conduct analytical tests on the recovered water samples for the parameters listed in Table 1 of ARM 16.14.706 unless field observations and measurements suggest otherwise.
12. conduct index and physical property tests on selected soil and rock samples. Tests would include grain size distribution, Atterberg limits, pH, organic content and permeability. Emphasis will be placed on grain size distribution because of its usefulness in estimating permeability, and undisturbed permeability using ASTM D5084 methodology.
13. conduct in situ permeability tests in each monitoring well using the slug test method unless sufficient water is available for a drawdown test.

Evaluation of Geotechnical Data

The acquisition of data is for the express purpose of characterizing and designing a ground water monitoring program for environmental protection. The following tasks and deliverables are anticipated:

14. evaluate all acquired field, office, and laboratory data with respect to the landfill and its influence on the environment, with emphasis on the geohydrologic regime. More specifically, we would address:
 - local hydrology in and around the landfill. TR55 methodology should be adequate. TR55 is a USDA Soil Conservation Service method for evaluating runoff based on soil type, vegetation, slope, and precipitation.
 - local and regional geohydrology including bedrock and surficial or near surface aquifers. To the extent possible, recharge zones would be defined and a water balance would be calculated. Values of transmissivity, hydraulic conductivity, gradient, porosity, and storativity would also be generated within the limitations of the data.
 - influences of the landfill on surface and ground water flows. Lateral and vertical extensions of the landfill will be included the evaluations.
15. design a ground monitoring plan which will provide the basis for continual evaluation of landfill impacts, if any, on the ground water system(s). The plan would include sampling frequency, changes in standard protocol for sampling if needed, analytic parameters, and recommended evaluation methods using appropriate statistical or probabilistic techniques. Formal ground water models such as MODFLOW or MOC do not appear necessary at this writing.
156. provide deliverables which include but are not necessarily limited to:

- base site plan at 1"=200'.
- surficial and bedrock maps at the same scale as the base map.
- ground water contours of the surficial or near surface aquifer and the bedrock aquifer.
- logs and monitoring well construction data using Unified Soil Classification System and ASTM descriptor methods.
- an engineering report describing our findings, conclusions, and recommendations. The latter could include additional ground water monitoring or surface water sampling locations.
- a ground water sampling plan which would encompass frequency, parameters, and data evaluation techniques. The plan will include the formalities of a Sampling and Analysis Plan or SAP.

CLOSURE

The work performed in this study will be conducted by and under the direction of Robert W. Gillespie, P.E. He will be assisted by Cynthia A. Thayer and Mark A. Weritz, P.E., both of whom have directly applicable landfill experience. Energy Labs of Billings, Montana will provide analytical services, and survey services will be accomplished by Civil Design Solutions of Lewistown, Montana. The work will conform in all respects to the requirements of Subchapter 7 and the standard of care exercised by other professional practicing in the general area.



SCALE 1" = 22 MI (APPROX.)

FROM MT. CENTENNIAL HIGHWAY MAP (1990)

LOCUS MAP WORK PLAN FOR SITE CHARACTERIZATION MR. M LANDFILL LEWISTOWN, MONTANA

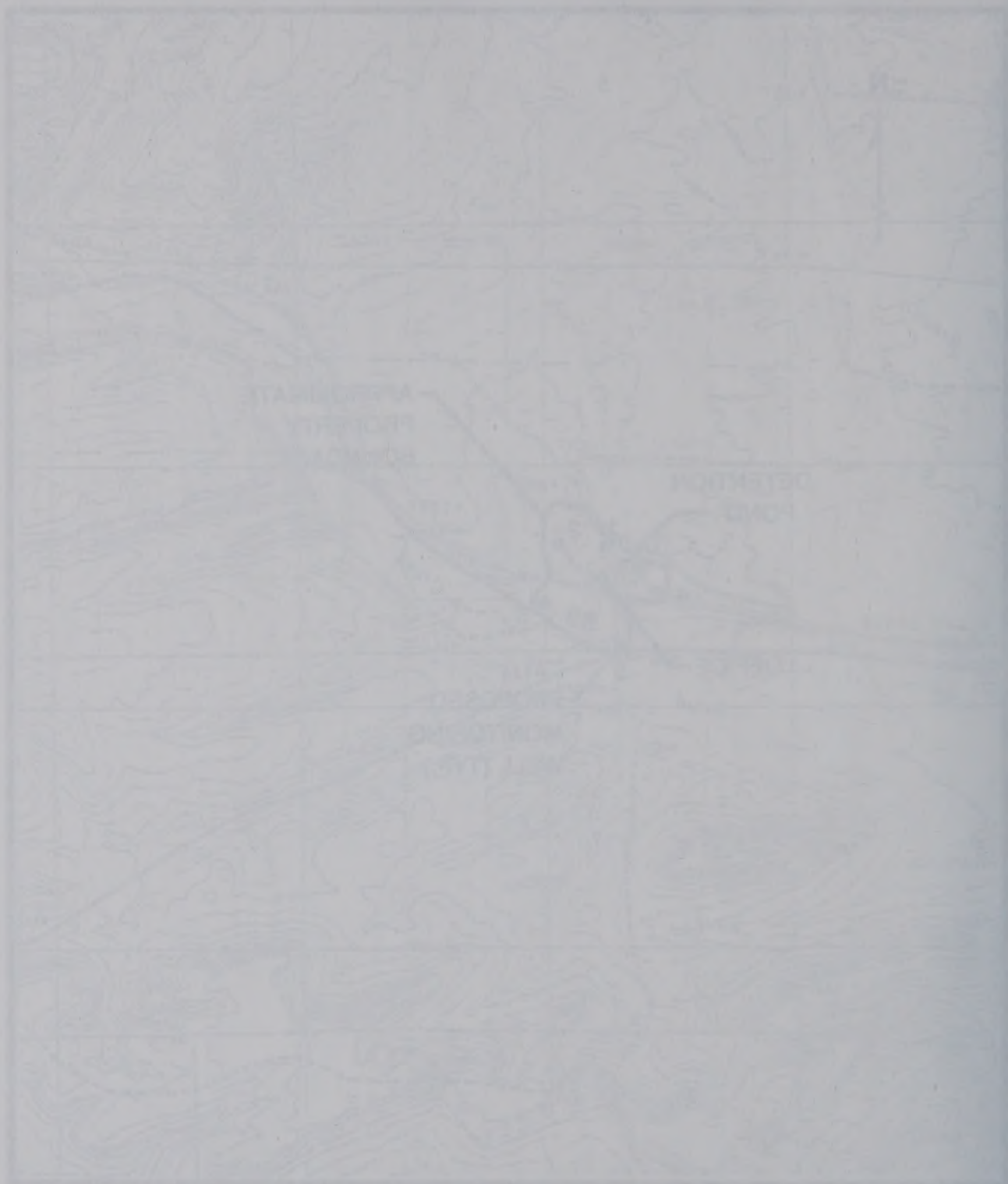
JANUARY 1993

PROJECT NO. 100-06



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USE THE GRID, IN CASE (1981)

SCALE 1" = 100' (1981)

SITE PLAN
 WORK PLAN FOR SITE CHARACTERIZATION
 MR. W. LANDOLL
 LEWISTOWN, MONTANA

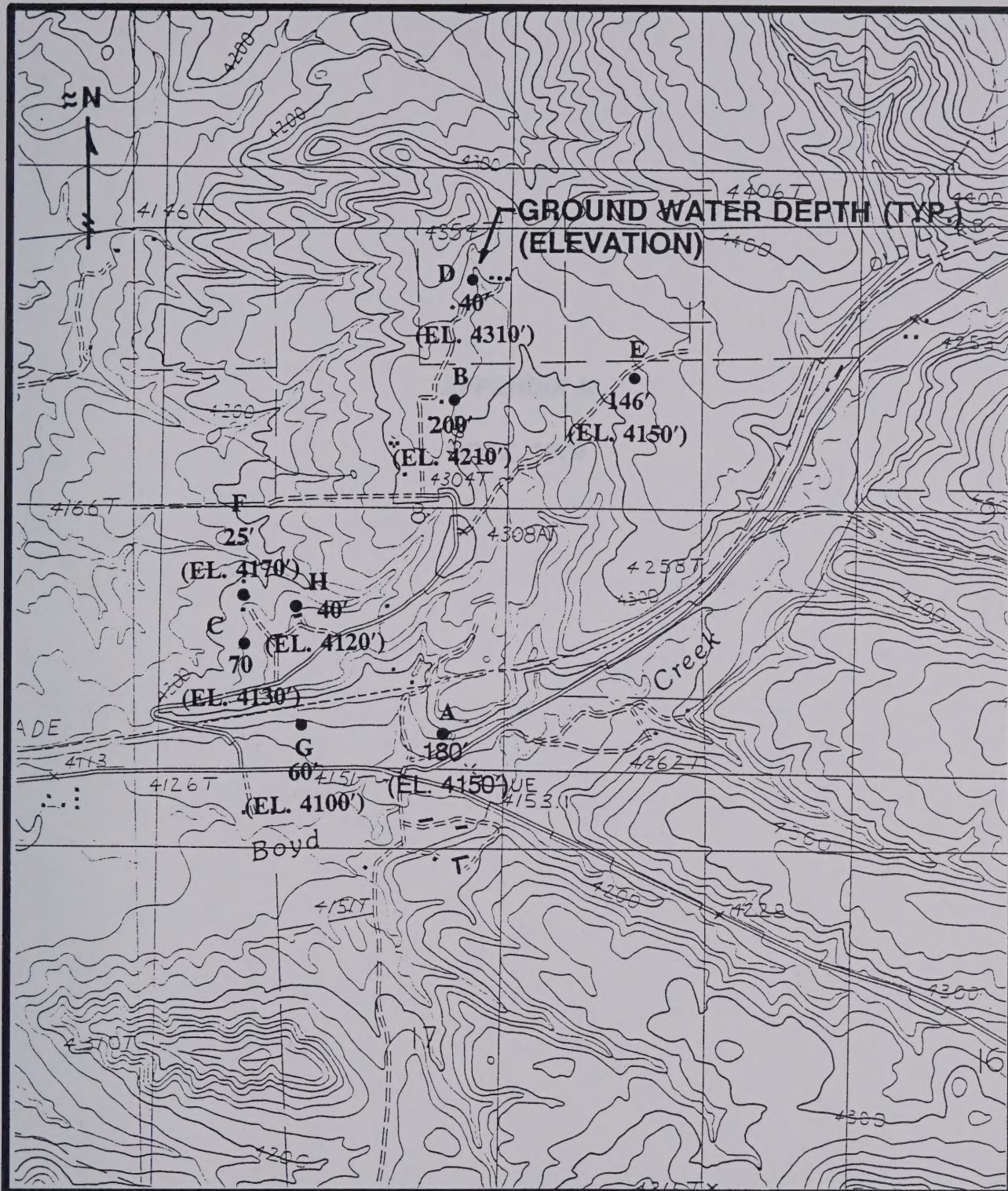
PROJECT NO. 101-10



ALL ARE A LANDOLL WORKSHEET & LAND-OWNERS

REV. 10/10/81

REV. APRIL 1983 - Added MW-6 &



SCALE 1" = 2800' (APPROX.)

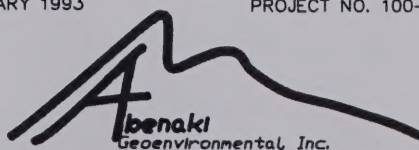
USGS PINE CREEK, MT QUAD (1985)

**WELL LOCATION AND GROUND WATER PLAN
WORK PLAN FOR SITE CHARACTERIZATION
MR. M LANDFILL
LEWISTOWN, MONTANA**

JANUARY 1993

PROJECT NO. 100-06

NOTE: See Appendix B for logs



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FIGURE 3

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APPENDIX A

BOTZ, 1979

December 12, 1979

Mr. Duane Robertson, Chief
Solid Waste Management Bureau
1400 Eleventh Avenue, Suite A
Helena, Montana 59601

Dear Duane:

Enclosed is my report describing hydrological conditions at two solid waste disposal sites near Lewistown, Montana. Results of this examination indicate portions of each site contain groundwater within 10 feet of the ground surface. Other portions of each of these sites, however, appear to meet all hydrological criteria for Class II sites.

I have delayed sending this report until I received site sketch maps. I have not as yet received these so I have developed rough sketch maps based on my site visits. Good plan maps are still needed for both these sites. I have some photos of the sites that I will send to you when they are processed.

Please call me if you have any questions on this report or need any further information.

Yours truly,

Max

Maxwell K. Botz, P.E.
Hydrologist-Engineer

MKB

MKB:bd
Enclosure

RECEIVED

MONTANA DEPARTMENT OF ENVIRONMENTAL
HEALTH & LABOR
GOLDEN RULE BUILDING

Ground Water Development

Geotechnical Investigation

Water Resources Engineering

Mining Hydrology

Water Quality

Water Rights

HYDROLOGICAL ASSESSMENT OF
TWO SOLID WASTE DISPOSAL SITES NEAR
LEWISTOWN, MONTANA

for

Mr. Duane Robertson, Chief
Solid Waste Management Bureau
1400 Eleventh Avenue, Suite A
Helena, Montana 59601

by

HYDROMETRICS
1300 Cedar Street
Helena, Montana 59601
406/443-4150

December 12, 1979

HYDROLOGICAL ASSESSMENT OF
TWO SOLID WASTE DISPOSAL SITES NEAR
LEWISTOWN, MONTANA

In November 1979, at the request of the Montana Solid Waste Management Bureau, two solid waste disposal sites near Lewistown, Montana were examined. Objectives of this examination were to appraise hydrological conditions at these sites and to determine if they meet all requirements for Class II solid waste disposal sites under the rules of the Montana Solid Waste Management Bureau. For solid waste disposal at Class II sites, Montana rules (Section 16-2.14(8)-S14315) require that groundwater be a depth of at least 10 feet beneath the bottom of the proposed landfill site and that permeability of the material underlying the site be less than 10^{-3} (2.83 ft/day). The primary focus of these site examinations was to determine existing groundwater conditions.

Field trips were taken to Lewistown to examine these solid waste sites on November 7, 8, 10 and 21, 1979.

CADOTTE DISPOSAL SITE

The Cadotte disposal site is approximately 2 miles east of Lewistown, Montana along Highway 87 (T15N,R18E,Section 7). This site is on a very small south-facing ephemeral tributary to Boyd Creek. This drainage is bowl shaped and is about 300 feet in diameter. Low hills surround the site and, in past years, portions of the bottom of the drainage have been used for disposal of solid wastes. It was reported by the site owner, Mr. Don H. Cadotte, that the site had a deeply incised stream channel which was backfilled with solid wastes. He also reported that the upper end of this drainage was used to bury wastes by

excavating deep trenches, filling with waste, and covering with soil.

A total of four backhoe pits were dug at this site (Figure 1) to determine subsurface geological conditions and depth to groundwater. The site appears to be underlain by dark-colored marine shales of the Colorado Formation of Cretaceous geological age. Overlying the shale bedrock is a thin mantle of light brown, stony, clayey silt.

The first test pit was dug on November 7, 1979 near the southern end of the proposed disposal site about 90 feet north of the old railroad center line. (See Figure 1.) This area is underlain by approximately three feet of compacted solid waste consisting primarily of wood and metal products. Underlying the solid waste material is a very firm, dark-colored, moist to very moist claystone. A blocky shale typical of the Colorado Formation and harder than the claystone was encountered at a depth of 7 feet. This first test pit was completed at a total depth of 13 feet in a very firm, dense, gray shale. The material was very moist but did not appear to contain free water. Approximately 10 minutes after completion of the test pit, groundwater began seeping into the trench at a depth of an estimated 12½-13 feet. Early the next morning (November 8, 1979), groundwater in Test Pit 1 was approximately 10 feet below the ground surface.

Test Pit 2 was dug on November 7, 1979 approximately 125 feet southwest of Test Pit 1 and near the upstream toe of the abandoned railroad embankment (Figure 1). Test Pit 2 contains approximately 2 feet of solid wastes and is underlain by very firm, blocky, dark-colored shale. At a depth of 10 feet, a slight amount of groundwater seeped into the hole after completion of excavation. On the following day (November 8, 1979), the water surface in Test Pit 2 was 8 feet below the ground surface.

After finding groundwater in the lower end of the proposed disposal site, two additional test pits were dug in the northwest portion of the site (Figure 1). Both these pits were dug to a depth of over 10 feet into a shale bedrock consisting of very firm, blocky shale which varied in color from brown to gray. These test holes were dug under the supervision of Bob Childers, sanitarian from Lewistown, on November 8, 1979. On November 10, 1979 no water was observed in these holes by M. K. Botz of Hydrometrics.

Bedrock at the Cadotte site is estimated to have a low permeability (less than 10^{-3} cm/sec) and appears to be transmitting a small quantity of groundwater southward toward Boyd Creek. This groundwater probably is derived from local infiltration on the disposal site and possibly from a small drainage north of the disposal site. The small quantity of groundwater from the Cadotte disposal area is not expected to impact groundwater resources except on and very near the site. It is estimated that the quantity of groundwater moving through the site is very small and chances of any off-site impacts are remote.

Approximately one-quarter mile north of the Cadotte site is a much larger east-west trending drainage. This drainage contained a small quantity of ponded water and several cattail patches, indicating continued wet conditions. This wet area appeared to be higher in elevation than the lower portion of the Cadotte site, and could be a source of groundwater recharge to the site.

The major stream drainage in the area is an estimated 400-600 feet south of the Cadotte site, and has a relatively flat ground surface and is underlain by alluvium of unknown thickness. There is one residence south of the site. This residence uses a drilled well to supply household water. The well is in a 10-12 foot deep pit which was constructed using 48-inch CMP

After finding groundwater in the lower part of the proposed
disposal site, two additional test pits were dug in the same
area. The results of the tests are shown in Figure 1. Both test pits were dug
to a depth of over 10 feet into a shale bedrock consisting of
very fine, shaly sand which varied in color from brown to
gray. The test pits were dug under the supervision of Mr.
Charles, a resident of the town, on November 2, 1970. On
November 10, 1970 no water was observed in these holes by J. K.
Sells of the Department.

Groundwater at the disposal site is estimated to have a low permeability
less than 10⁻³ dyne/cm² and appears to be contained in a small
quantity of groundwater beneath the sand. This
groundwater probably is derived from local infiltration on the
disposal site and possibly from a small stream north of the
disposal site. The small quantity of groundwater beneath the
disposal area is not expected to impact groundwater resources
located on and near the site. It is estimated that the
quantity of groundwater moving through the site is very small
and volume of any effluent is negligible.

Geologically, the disposal site north of the disposal site is a
very light gray, fine-grained sandstone. This sandstone contains
a small quantity of rounded water and several small pebbles.
The sandstone is composed of sand and gravel. This sand is not
to be placed in the disposal site. The lower portion of the disposal
site and could be a source of groundwater beneath the site.

The upper portion of the disposal site is a very light gray, fine-grained
sandstone. This sandstone contains a small quantity of rounded water
and several small pebbles. This sandstone is not to be placed
in the disposal site. The lower portion of the disposal site
and could be a source of groundwater beneath the site.

(corrugated metal pipe). The CMP contains a few slots near the ground surface. Near the bottom of the CMP is the well and pressure tank. The well seal has been modified to accommodate the drop pipe and pump wire. Neither the well nor the CMP is sealed to prevent entrance of surface water or debris.

THE MR. M DISPOSAL SITE

This site is approximately 3.1 miles east of Lewistown along Highway 87 in Township 15N, Range 10E, Section 8 and is owned by Mr. Marvin Mintyala. This active site has been used for waste disposal for a number of years. The site is in a small, south facing drainage basin entirely underlain by shales, claystones and sandstones of the Kootenai Formation of Cretaceous geological age. These bedrock strata are nearly horizontal and are reddish brown, yellow, cream and purple, which is typical of this formation. Bedrock is overlain by a thin layer of light brown-colored, silty soil.

A total of 5 test pits were dug on the property by a backhoe to determine subsurface geological and groundwater conditions. A sketch map of the property and backhoe pit locations is shown on Figure 2.

Test Pits 1, 2 and 3 were dug the week of November 19, 1979 under the supervision of Bob Childers. On November 21, 1979 these three test pits were examined and two additional pits were dug. (See Figure 2 for test pit locations.) All test pits were dug to a depth of at least 10 feet and encountered claystone, sandstone and shales of the Kootenai Formation. Generally, the bedrock was weathered near the ground surface and became harder with depth and was relatively fresh in the pit bottoms. Although the soils were very moist in all pits, Test Pit 2 was the only pit that contained groundwater. On November 21, 1979 groundwater was present in Test Pit 2 at

a depth of 8.5 feet below the ground surface.

Bedrock at the Mr. M site as determined from test pits and examination of surficial geology has a very low permeability (less than 10^{-3} cm/sec) and will transmit very little groundwater. Test Pit 5 is about 40 feet from a small pond. The bottom of the pit was several feet lower than the water surface in the pond, yet no groundwater seeped into the test pit during or after excavation. This indicates a very low bedrock permeability. The disposal area is drained by small ephemeral streams that flow water only during spring snowmelt or during periods of intense precipitation. There are two small ponds on the disposal site (Figure 2). As reported by the operator, the largest pond normally contains waters from runoff but dried up by late September or early October 1970. According to the operator, the largest pond overflowed during snowmelt from the severe winter of 1978. However, it normally does not overflow.

The smaller pond contained water in November 1970 and is about 20 feet north of the larger pond. This pond appears to be supplied by water from a small seep near its north end (Figure 2). Several small seeps around the area of buried wastes (Figure 2) are reported by the operator to be caused by horizontal movement of water from the layered, buried wastes. The top of each layer apparently is impervious and causes infiltrating water to migrate laterally to the edge of the buried wastes to form small seeps.

Groundwater present in Test Pit 2 probably is related to water ponded at this site and probably does not indicate a regional groundwater system. This waste disposal site appears to have no impact on groundwater resources.

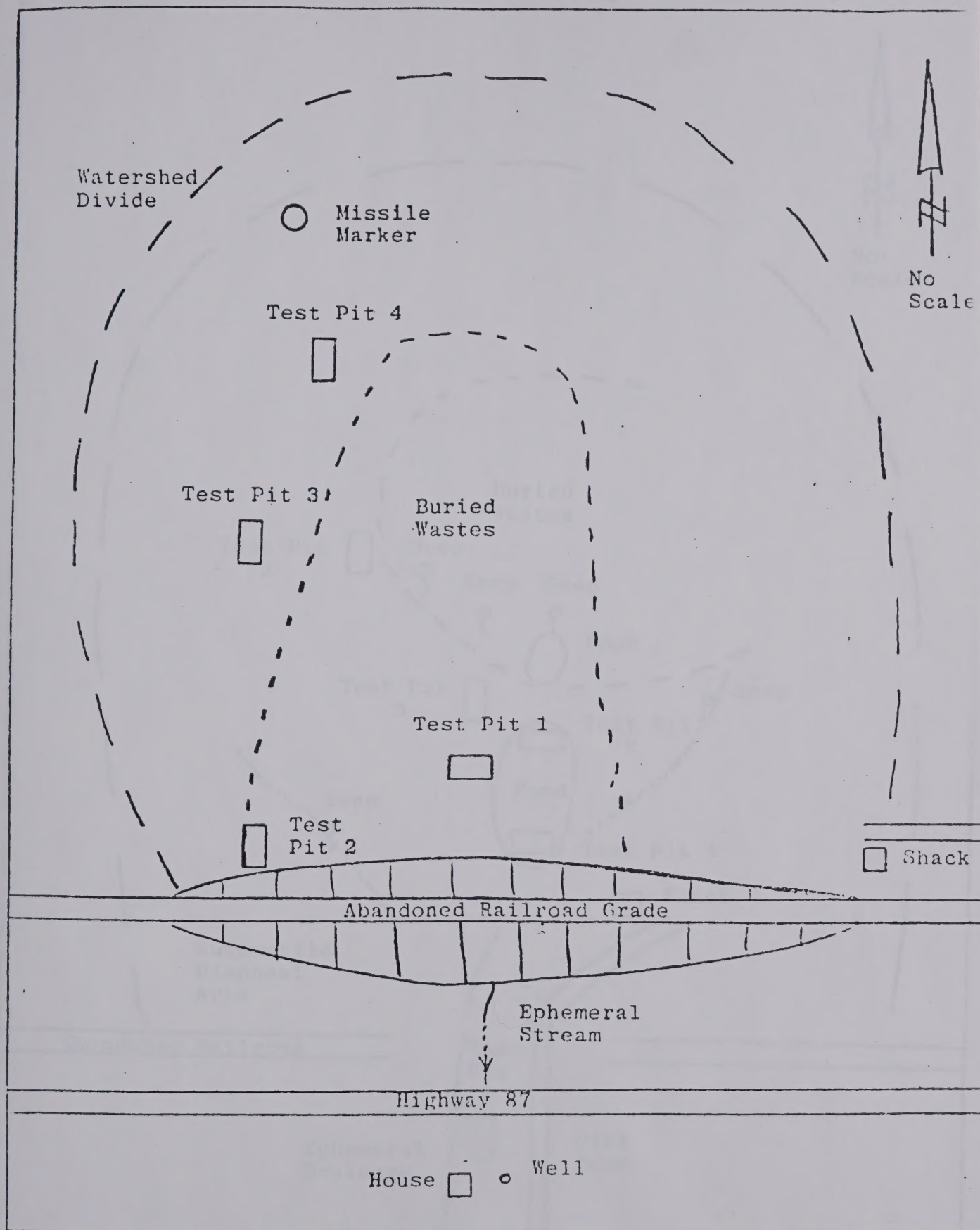


FIGURE 1. SKETCH MAP SHOWING LOCATIONS OF TEST PITS AT THE CADOTTE DISPOSAL SITE

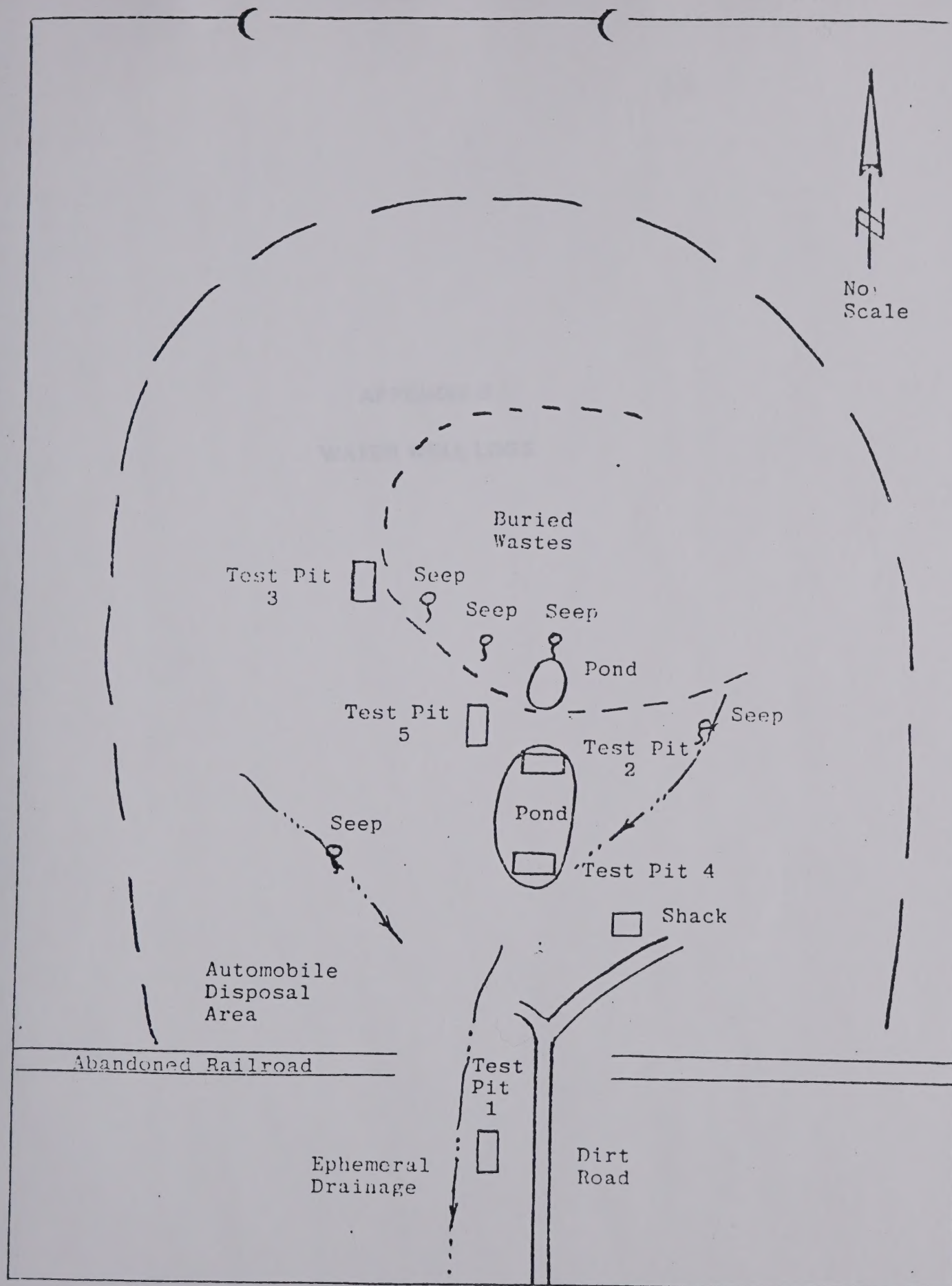


FIGURE 2. SKETCH MAP SHOWING LOCATIONS OF TEST PITS AT THE MR. M. DISPOSAL SITE

APPENDIX B

WATER WELL LOGS

I w

File No. _____

State law requires that this form be filed by the water well driller within 60 days after completion of the well.

abstract printers of minerals

DEPARTMENT COPY

DRILLER: Please give this copy to the well owner to complete return side

5 W

RECEIVED

WL.4725

C

1. WELL OWNER Name <u>Jim Larson</u>	2. CURRENT MAILING ADDRESS <u>Gilt Edge Route</u> <u>Lawiston Mt</u>
---	--

3. PROPOSED USE _____ ☒ domestic (includes lawn and garden); _____ stock; _____ municipal; _____ industrial;
_____ irrigation; _____ other (specify): _____

4. WELL LOCATION

T. 15 SW NW SW SE Section 8
R. 19

OR, Lot _____ Block _____
Subdivision _____
City _____ County _____
Elevation _____ Accuracy: _____ ±10'; _____ ±50'; _____ ±100';

8. WELL TEST DATA _____ pump ☒ bailer _____ other _____
(if other, specify) _____
Pumping level below land surface:
100 ft. after 1 hrs. pumping 15 gpm
_____ ft. after _____ hrs. pumping _____ gpm

9. WAS WELL PLUGGED OR ABANDONED? _____ Yes ☒ No
If yes, how? _____

10. DATE STARTED 9/28/78
DATE COMPLETED 5/25/79

11. WELL LOG

Depth (ft.)		Formation
From	To	
0	5	yellow + gray shale
5	65	sandstone streaks
65	92	gray-blue shale, streaks of sandstone
92	95	soft gray shale
95	110	hard, light blue sandstone
110	112	greenish-gray shale
112	120	gray shale + sandstone
120	260	gray-red shale
260	320	red shale
320	350	b/c - shale streaks of rock
350		white sandstone + water

5. DRILLING METHOD _____ cable, _____ bored, _____
☒ forward rotary, _____ reverse rotary, _____ jetted,
_____ other (specify) _____

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations	Screen	Kind Size	From (feet)	To (feet)
6 1/4"	4" PVC	12	350	☒ and/or				
	4 1/4" steel	0	12			3/8 holes	250	350

Was casing left open end? _____ Yes, _____ ☒ No
Was a packer or seal used? ☒ Yes, _____ No
If so, what material rubber
Was the well gravel packed? _____ Yes, _____ ☒ No
Was the well grouted? ☒ Yes, _____ No
To what depth? 20 feet
Material used in grouting cement
Well head completion: Fiddler adapter ☒
12 in. above grade _____ other _____
(if other, specify) _____
Pump horsepower _____, pump type _____
Pump intake level _____ feet below land surface
Power (electric, diesel, etc.) _____

7. WATER LEVEL
Static water level 20' feet below land surface
If flowing, closed-in pressure _____ psi
_____ gpm flow through _____ inch pipe
Controlled by: _____
(if other, specify) _____

12. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.
10/10/78
DeBuss Drilling
Gilt Edge Route
Jim Larson

North of Clark Johnson

M W

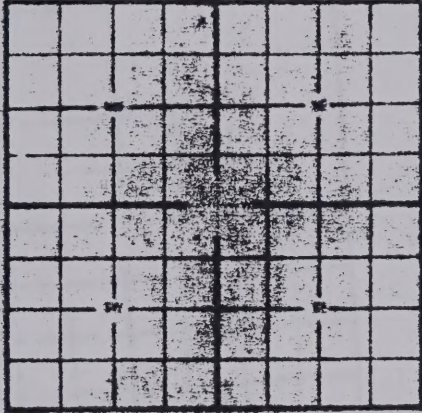
Form No. 1-79

File No. _____

D

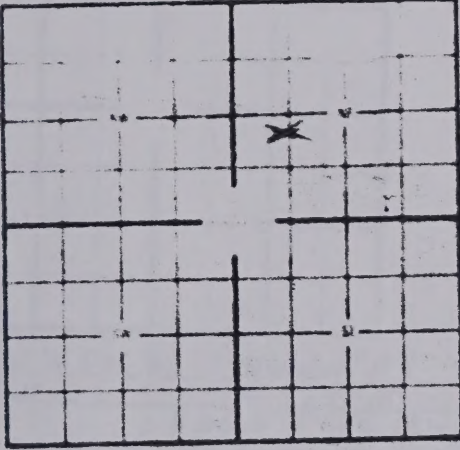
WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well

1. WELL OWNER Name <u>Ralph Biral</u>	6. WATER LEVEL Static water level <u>4-6'</u> feet below land surface If flowing, closed-in pressure _____ psi _____ gpm flow through _____ inch pipe Controlled by: _____ valves, _____ reducers, _____ other (if other, specify) _____																					
2. CURRENT MAILING ADDRESS <u>1111 1st St.</u> <u>San Antonio, Texas 78205</u>	7. WELL TEST DATA _____ pump ☒ bailer _____ other _____ (If other, specify) _____ Pumping level below land surface: <u>216</u> ft. other <u>4</u> hrs. pumping <u>15</u> gpm _____ ft. other _____ hrs. pumping _____ gpm																					
3. WELL LOCATION  NE 1/4 NW 1/4 Section 8 Township 15 S Range 10 E County <u>BERGAMOT</u> Lot _____ Block _____ Subdivision _____ Well Elevation <u>4600'</u> Accuracy: _____ ±10' _____ ±50' _____ X ±100'	8. WAS WELL FLOODED OR ABANDONED? Yes ☒ No _____ (If yes, how) _____ 9. DATE STARTED <u>12-22-82</u> DATE COMPLETED <u>2-6-83</u>																					
4. DRILLING METHOD _____ cable _____ rotary _____ ☒ Direct drive _____	10. WELL LOG <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Depth (ft.)</th> <th>Formation</th> </tr> <tr> <th>From</th> <th>To</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>32</td> <td>Gray shale</td> </tr> <tr> <td>32</td> <td>65</td> <td>Red clay</td> </tr> <tr> <td>65</td> <td>156</td> <td>gray sandy shale</td> </tr> <tr> <td>156</td> <td>190</td> <td>sandy shale & rock str.</td> </tr> <tr> <td>190</td> <td>220</td> <td>sand (aquifer)</td> </tr> </tbody> </table>	Depth (ft.)		Formation	From	To		0	32	Gray shale	32	65	Red clay	65	156	gray sandy shale	156	190	sandy shale & rock str.	190	220	sand (aquifer)
Depth (ft.)		Formation																				
From	To																					
0	32	Gray shale																				
32	65	Red clay																				
65	156	gray sandy shale																				
156	190	sandy shale & rock str.																				
190	220	sand (aquifer)																				
5. WELL CONSTRUCTION <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Size of drilled hole</th> <th>Size and weight of casing</th> <th>Depth (ft.)</th> <th>Size of casing</th> <th>Depth (ft.)</th> <th>Size of casing</th> <th>Depth (ft.)</th> </tr> </thead> <tbody> <tr> <td>6 1/4</td> <td>4 1/2 (100 ft)</td> <td>0</td> <td>220</td> <td>3/8</td> <td>180</td> <td>220</td> </tr> </tbody> </table>	Size of drilled hole	Size and weight of casing	Depth (ft.)	Size of casing	Depth (ft.)	Size of casing	Depth (ft.)	6 1/4	4 1/2 (100 ft)	0	220	3/8	180	220	11. DRILLER'S CERTIFICATION This well was drilled under my jurisdiction and this report is true to the best of my knowledge. <u>2-16-83</u> _____ Kelly Drilling Co. Box 246 Roundup, Mont. _____ Charles Kelly _____ Licence No. 169							
Size of drilled hole	Size and weight of casing	Depth (ft.)	Size of casing	Depth (ft.)	Size of casing	Depth (ft.)																
6 1/4	4 1/2 (100 ft)	0	220	3/8	180	220																
Was casing left open end? ☒ Yes _____ No _____ Was a packer or seal used? ☒ Yes _____ No _____ If so, what material? <u>Rubber</u> Was the well gravel packed? ☒ Yes _____ No _____ Was the well grouted? ☒ Yes _____ No _____ To what depth? <u>12 ft</u> Material used in grouting <u>gravel</u> Well head completion: Filter or screen 12 in. screen grade _____ other _____ (If other, specify) <u>none</u> Pump horsepower <u>3/4</u> pump type <u>sub</u> Pump intake level <u>216</u> feet below land surface Power (electric, diesel, etc.) <u>Electric</u>	(see separate sheet if necessary)																					

1
WELL OWNER
NAME Ronald Denton

2
CURRENT MAILING ADDRESS
7 1/2 - N E Broadway
Louisiana, Mt. 54457

3
WELL LOCATION


4
DRILLING METHOD
☒ cable, ☐ bored,
☒ forward rotary, ☐ reverse rotary, ☐ jetted,
☐ other (specify) _____

5
WATER LEVEL
Static water level 146 feet below land surface
If flowing closed-in pressure _____ psi
20 gpm flow through 6 1/4 inch pipe
Controlled by _____ valve _____ reducers _____ other _____
(if other specify) _____

6
WELL TEST DATA
pump _____ bailer _____ other _____
(if other, specify) _____
Pumping level below land surface _____
R. after _____ hrs pumping _____ gpm
R. after _____ hrs pumping _____ gpm

7
WAS WELL PLUGGED OR ABANDONED? ☐ Yes ☒ No
If yes, how? _____

8
DATE STARTED 6-16-81
DATE COMPLETED 6-23-81

9
WELL LOG
Depth (ft.)

From	To	Formation
0	20	Brownish sandy shale
20	104	red sand shale
104	140	redish blue sand shale
140	223	gray green sand, red shale
223	244	top of sand

10
Section 8
Township 15 N/S Range 19 EW
County Fergus
Lot _____ Block _____
Subdivision _____
Well Elevation 3500
Accuracy: ☐ ± 10' ☐ ± 50' ☒ ± 100'

11
5. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations		
				Screen	X	and/or
☒ 6 1/4	Steel	0	244	Kind Size	From (feet)	To (feet)
				6 1/4	144'	244'

12
Was casing left open end? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
If so, what material? rubber
Was the well gravel packed? ☐ Yes ☐ No
Was the well grouted? ☒ Yes ☐ No
To what depth? 244
Material used in grouting cement
Well head completion: Filter adapter
12 in. above grade other _____
(if other, specify) _____
Pump horsepower _____ pump type _____
Pump intake level _____ feet below land surface

11
DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report true to the best of my knowledge.
8/11/81

Thatcher Drilling Co.
P.O. Box 322, Sanford, N.C.

Thatcher

F

This well shall be drilled within 30 days after completion of the well and Form 602 Notice of Completion shall be filed with the local health department within 60 days after the water has been put to beneficial use.

1. WELL OWNER

Name A. J. Lauer

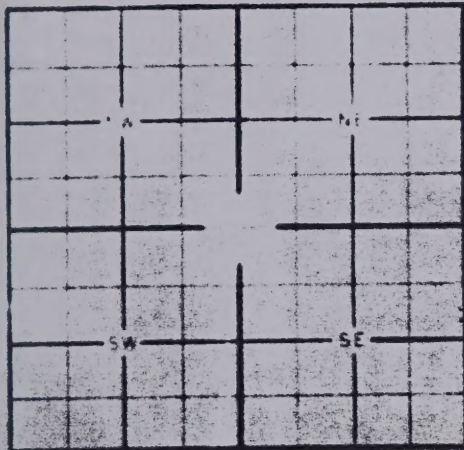
2. CURRENT MAILING ADDRESS

Box 112
Summit, Montana

3. PROPOSED USE

☒ domestic (includes lawn and garden); ☐ stock; ☐ municipal; ☐ industrial;
☐ irrigation ☐ other (specify) _____

4. WELL LOCATION

SW X NW X SE X Section 8T. 15 N. 19 E

N or S E or W

OR, Lot _____ Block _____

Subdivision _____

City _____ County FergusElevation _____ Accuracy: ☐ ±10'; ☐ ±50'; ☐ ±100'

5. DRILLING METHOD

☒ cable, ☐ bored,
☒ forward rotary, ☐ reverse rotary, ☐ jetted,
☐ other (specify) _____

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations ☒ and/or Screen	Kind	Size	From (feet)	To (feet)
<u>6 1/4"</u>	<u>4 1/2" 20 PVL 160 psi</u>	<u>0</u>	<u>320</u>	<u>3/8 holes</u>			<u>320</u>	<u>320</u>

Was casing left open and? ☐ Yes ☒ NoWas a packer or seal used? ☒ Yes ☐ NoIf so, what material? rubberWas the well gravel packed? ☐ Yes ☐ NoWas the well grouted? ☒ Yes ☐ NoTo what depth? 20Material used in grouting rubber and cementWell head construction: From depth 012 in. above grade ☐ other ☐

(if other, specify) _____

Pump horsepower _____ pump type _____

Pump intake level _____ feet below land surface

Pump discharge (above sea) _____

7. WATER LEVEL

Static water level 25'

K factor (drawdown) _____

Pumping rate (gpm) _____

Casing diameter (in.) _____

8. WELL TEST DATA

pump ☒ boiler ☐ other ☐

(if other, specify) _____

Pumping level below land surface:

100 ft. after 1 hrs. pumping 15 gpm

_____ ft. after _____ hrs. pumping _____ gpm

9. WAS WELL PLUGGED OR ABANDONED? ☐ Yes ☒ No

If yes, how? _____

10. DATE STARTED 4/24/78DATE COMPLETED 5/10/78

11. WELL LOG

Depth (ft.)

From	To	Formation
<u>0</u>	<u>10</u>	<u>Topsoil + clayey shale</u>
<u>10</u>	<u>90</u>	<u>blue + yellow shale</u>
		<u>strata of sandstone</u>
<u>90</u>	<u>250</u>	<u>red shale</u>
		<u>blue + gray</u>
<u>250</u>	<u>300</u>	<u>blue gray shale</u>
		<u>of light gray sandstone</u>
<u>300</u>	<u>320</u>	<u>light gray hard sandstone</u>
		<u>+ water</u>

12. DRILLER'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

D. R. H. DrillingBox 2 - Box 112

EW

G

Form No. 603 R9/82

RECEIVED
File No. DAY 02 1984

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well.

DEPT. OF NATURAL RESOURCES & CONSERVATION

1. WELL OWNER Name <u>Track Sweeney</u>				6. WATER LEVEL Static water level <u>60</u> feet below land surface If flowing, closed-in pressure _____ psi _____ gpm Controlled by: _____ valve _____ reducers, _____ other (specify) _____																																							
2. CURRENT MAILING ADDRESS <u>P.O. Box 636</u> <u>Leinstown MT 59457</u>				9. WELL TEST DATA ☒ pump _____ bailer _____ other (specify) _____ Pumping level below land surface: <u>140</u> gpm after <u>3</u> hrs. pumping <u>12</u> gpm _____ gpm after _____ hrs. pumping _____ gpm																																							
3. WELL LOCATION County <u>Parade</u> Township <u>15</u> N/R Range <u>11</u> E/W <u>SW 1/4 SW 1/4</u> Section <u>8</u> Lot _____ Block _____ Subdivision _____				10. WAS WELL PLUGGED OR ABANDONED? Yes ☐ No ☒ If yes, how? _____																																							
4. PROPOSED USE Domestic ☒ Stock ☐ Irrigation ☐ Other (specify) _____				11. DATE COMPLETED <u>April 3, 1984</u>																																							
5. DRILLING METHOD _____ ☒ Forward rotary _____ ☐ Reverse rotary _____ other (specify) _____				12. WELL LOG Depth (ft.) From To Formation <table border="1"><tr><td>0</td><td>30</td><td>Skatey shale w/ yellow sandstone streaks</td></tr><tr><td>30</td><td>70</td><td>Blue shale</td></tr><tr><td>70</td><td>90</td><td>White sandstone w/ shale layers</td></tr><tr><td>90</td><td>95</td><td>Blue shale</td></tr><tr><td>95</td><td>115</td><td>Green sandstone</td></tr><tr><td>115</td><td>120</td><td>Red beds</td></tr><tr><td>120</td><td>220</td><td>Hard rock</td></tr><tr><td>220</td><td>250</td><td>Red shale</td></tr><tr><td>250</td><td>255</td><td>Hard rock</td></tr><tr><td>255</td><td>265</td><td>Shale + flint w/ layers sandst.</td></tr><tr><td>265</td><td>268</td><td>Hard rock</td></tr><tr><td>268</td><td>297</td><td>White sandstone (water)</td></tr></table>				0	30	Skatey shale w/ yellow sandstone streaks	30	70	Blue shale	70	90	White sandstone w/ shale layers	90	95	Blue shale	95	115	Green sandstone	115	120	Red beds	120	220	Hard rock	220	250	Red shale	250	255	Hard rock	255	265	Shale + flint w/ layers sandst.	265	268	Hard rock	268	297	White sandstone (water)
0	30	Skatey shale w/ yellow sandstone streaks																																									
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265	268	Hard rock																																									
268	297	White sandstone (water)																																									
5. WELL CONSTRUCTION AND COMPLETION <table border="1"><thead><tr><th>Size of drilled hole</th><th>Size and weight of casing</th><th>From (feet)</th><th>To (feet)</th><th>Perforations (feet)</th><th>From (feet)</th><th>To (feet)</th></tr></thead><tbody><tr><td>5 7/8"</td><td>4 1/2" OD PVC 200 ft. 1 inch</td><td>0'</td><td>271'</td><td>5 1/16" hole</td><td>72</td><td>92</td></tr><tr><td></td><td></td><td></td><td>290'</td><td></td><td>250</td><td>290</td></tr></tbody></table>				Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations (feet)	From (feet)	To (feet)	5 7/8"	4 1/2" OD PVC 200 ft. 1 inch	0'	271'	5 1/16" hole	72	92				290'		250	290	13. DRILLER'S CERTIFICATION This well was drilled under my jurisdiction and this report is true to the best of my knowledge. <u>April 3, 1984</u> <u>Singley Drilling</u> 1016 W. Broadway, Leinstown MT <u>Walter O. Singley</u> 398 License No. _____																		
Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations (feet)	From (feet)	To (feet)																																					
5 7/8"	4 1/2" OD PVC 200 ft. 1 inch	0'	271'	5 1/16" hole	72	92																																					
			290'		250	290																																					
7. WHAT IS THE TEMPERATURE OF THE WATER? <u>40</u> Degrees Fahrenheit ☐ Measured ☒ Estimated																																											
MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION 32 SOUTH EWINO HELENA, MONTANA 59620 445-3062 DNRC																																											

DEPARTMENT COPY

DRILLER: Please give this copy to the well owner to complete reverse side.

OWNER: Complete reverse side Form 602 and send to DNRC.

5A

H

(11)

OF MONTANA

NATURAL RESOURCES AND CONSERVATION

WELL LOG REPORT

BW

(H)

Log form to be filed by the water well driller on any well drilled after Jan. 1, 1973 within ninety (90) days of completion.

Name Marvin E. Kelly & Co. Address RT 3 Leavitt Town 124.

WELL LOCATION: County Fergus SE 14 SW 4, Sec 8, Twp 15 N R 19 W

PROPOSED USE: ☒ Domestic ☒ Stock ☐ Municipal ☐ Industrial ☐ Other (if other, specify)

WELL DRILLING: ☒ Cable ☐ Sored ☐ Reverse Rotary ☐ Other (if other, specify)

WELL HOLES: Hole 5-8 inches: Depth 120 ft. Casing: Steel ☒ Plastic ☐ Concrete ☐ Welded ☐ Other (if other, specify)

WELL DIAMETER: From 2.44 inches To 4 inches up feet 120 feet

Has perforated pipe used? ☒ Yes ☐ No Length of pipe perforated 40 feet Was casing left open end? ☒ Yes ☐ No Was a well screen installed? ☐ Yes ☒ No Material stainless steel Dia. 4 inches (stainless steel, bronze, etc.)

Perforation type: slots ☐ holes ☒ Size 5/16 sec from 80 feet to 120 feet Size 5/16 sec from 80 feet to 120 feet Size 5/16 sec from 80 feet to 120 feet

Was a packer or seal used? ☒ Yes ☐ No If so, what material Rubber

Well type: ☐ Straight screen ☐ Graveled Was the well grouted? ☒ Yes ☐ No To what depth? 40 feet

Material used in grouting Cement

Well head completion: Pitless adapter ☒ 12" above grade ☐ Other (If other, specify)

Was the well disinfected? ☒ Yes ☐ No

WATER LEVEL: Static water level 40 ft. below land surface Is flowing: closed-in pressure 0 psi GPM flow 0 through 0 inch pipe Controlled by: Valve ☐ Reducers ☐ Other, specify

WELL TEST DATA: ☒ Pump ☐ Bailer ☒ Other (If other, specify) air

Flow rate below land surface: 84 gpm at 2 hrs. pumping 25 gpm

Flow rate below land surface: 84 gpm at 2 hrs. pumping 25 gpm

8. WELL LOG:		Remarks
Depth (ft.)	From To	
0	80	Layers of yellow rock
80	120	Red shale & variegated sandstone.

9. DATE STARTED: Feb 2, 1976

10. DATE COMPLETED: Apr 2, 1976

11. WAS WELL PLUGGED OR ABANDONED? ☐ Yes ☒ No If so, how

12. DRILLER'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

George O. Singley 19
Driller's or Firm Name License No.

RT 2 Box 4 Leavitt Town 124.
Address

May 1976
Signed by

